IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

ERICSSON INC., and TELEFONAKTIEBOLAGET LM ERICSSON, **Plaintiffs and Counter-Defendants,** **v.** **TCL COMMUNICATION TECHNOLOGY HOLDINGS LTD., TCT MOBILE LIMITED, and TCT MOBILE (US), INC.,** **Defendants and Counter-Claimants.**	**Case No. 2:15-cv-11** **DECLARATION OF STEVEN H. GOLDBERG IN SUPPORT OF DEFENDANTS' RESPONSIVE CLAIM CONSTRUCTION BRIEF**

I, Steven H. Goldberg, declare:

I. INTRODUCTION

1. My name is Steven H. Goldberg, Ph.D. I presently work as an independent technical consultant and expert. I am also presently a partner in a venture capital firm, Venrock Associates, in Palo, Alto, CA.

2. I have been retained by TCL Corporation; TCL Communication Technology Holdings, Ltd.; TCT Mobile Limited; and TCT Mobile (US) Inc. (collectively, "Defendants" or "TCL") to provide my expert opinions regarding U.S. Patent No. 6,535,815 ("the '815 patent"). More specifically, I have been asked to give my opinion about the meanings of certain terms of the '815 Patent claims. I provide this declaration in support of TCL's opening claim construction brief.

3. I am being compensated for my work in this matter at a rate of $350 per hour. I am also reimbursed for my reasonable expenses incurred in connection with my work on this proceeding. My compensation in no way depends upon the outcome of this proceeding.

II. EXPERT QUALIFICATIONS AND CREDENTIALS

4. My qualifications for presenting the opinions in this declaration are set forth in my curriculum vitae, a copy of which is attached as Appendix A to this declaration.

5. I received my Bachelor of Science in Electrical Engineering from Washington University, Saint Louis, Missouri in 1975. I received a Master of Science degree in Electrical Engineering from Washington University, Saint Louis, Missouri in 1980. I received a Ph.D. in Electrical Engineering from the University of California at Santa Barbara in 1988. My doctoral studies focused on Signal Processing for Broadband Communications.

6. As reflected in my curriculum vitae, I have had more than 30 years of experience as a production engineer, instructor, visiting professor, program manager, and executive in the wireless communications and navigation fields.

7. With respect to positioning technologies, from 1991 to 1993, I was an engineer in the Trimble Navigation Survey Division, Sunnyvale, CA., where I led the design of a differential GPS (DGPS) radio system, branded as TrimTalk, for communicating DGPS corrections to Trimble 4000 survey receivers. These systems were used in a variety of applications including agriculture, construction, and general positioning applications. Thousands of TrimTalk radios were sold during the 1990's and early 2000's.

8. From 1993 to 1995 I was a Manager in the Communications Systems Group in the Vehicle Tracking Division at Trimble. During this time period and prior to the December 22, 2000, filing date of the '815 patent, Trimble was one of the leading GPS navigation companies.

9. In my role as Manager, my responsibilities included directing engineering teams from concept to fully functional end-user installations, interacting with the core GPS ASIC development team, and serving as a corporate-wide technical resource for strategic planning and intellectual property. I also co-created a new product line for tracking people and cargo using cellular phones with GPS. This product line was and is sold under Crosscheck brand. Tens of thousands of these products were sold globally over a 10 year period. The product can still be purchased today.

10. As a result of my work at Trimble, prior to the filing date of the ’815 patent I had (i) a graduate degree in electrical engineering and (ii) over four years of experience in the design and development of GPS based location services, systems, and/or devices, including mobile terminals equipped with a GPS receiver. Thus, as of the filing date of the ’815 patent, I was at least a person of ordinary skill in the art of the ’815 patent (*see* Sections VI below) and had direct personal knowledge of the technologies involved in the ’815 patent.

11. From 2008 to 2009, I again worked for Trimble in Sunnyvale. During the 2008 to 2009 period, I was a Program Manager in the Military Division of Trimble. As a Program Manager, I led an interdisciplinary team of engineers (hardware, software, mechanical, RF) in designing next generation military M-Code GPS receivers for in-flight applications in cooperation with program partners

Raytheon, General Dynamics and the U.S. Air Force GPS Wing contracting organization.

12. My other relevant work experience in the communications industry is summarized below.

13. From 1979 to 1988, I was a Production Engineer in the Microwave Semiconductor Division of Hewlett-Packard Company in Palo Alto, California. I was responsible for production line support, product improvement and new product introduction for microwave GaAs FET amplifiers and a broad range (1-18 GHz) RF and microwave passive component line. Additionally, I also served as an instructor in the Microwave and Communications Group Training Center at Hewlett-Packard. In this role, I was responsible for course development and teaching of a variety of electronic measurement subjects on a global basis to HP customers and newly hired HP engineers, covering topics such as transmission lines, network analysis, spectrum analysis, noise figure, general signal processing techniques, modulation and telecommunications principles. From 1982 to 1983, I also accepted a temporary assignment as a Hewlett-Packard Visiting Professor at North Carolina A&T State University, teaching undergraduate electrical engineering courses.

14. From 1988 to 1991, I was a Program Manager in the Wireless Communication Division of Applied Signal Technology in Sunnyvale, CA. At

Applied Signal Technology, I directed the development of a wideband, 1-40 GHz, 'flexible' surveillance receiving system. I also developed a company-wide technical training program for over 200 company employees, where I taught Digital Signal Processing, Adaptive Filtering, and Digital Communications courses to company employees.

15. As noted above, from 1991 to 1995 I was employed at Trimble Navigation.

16. From 1995 to 1997, I was the Vice President and General Manager of the Wireless Communication Division of Cylink Corporation. At Cylink, I created the Wireless business unit/division, whose products included spread spectrum radio-modems with worldwide distribution in over 90 countries. I built the division's management team in sales, marketing, engineering, customer service, and manufacturing, and managed the Cylink cordless phone ASIC business. In March 1998 P-Com, Inc. acquired the Cylink Wireless Division. From August to November 1998, I joined P-Com to manage the integration of the Cylink Wireless Division into that company.

17. From 1997 to 1998, I was the President and CEO of Verticom, Inc., a wireless technology company designing and developing radio subsystems for satellite and terrestrial wireless infrastructures.

18. From 1999 to 2000, I was Vice President for Research and Development in the Nokia Internet Communications division of Nokia Corporation. At Nokia, I had overall responsibility for a $70 million R&D budget and 275 engineers worldwide working on core products tied to networking and Internet application appliances with strong ties to next generation packet-based cellular systems. I also led the development of the global firewall appliance business of this division, including the IP530, IP740, ISS appliance, and Anti-Virus appliance, and their operating systems, and managed a 20+ person ASIC team developing packet processing acceleration ASICs. I also participated in the integration of the recently acquired start-up, Ipsilon Networks, and its growth from $50M to over $300M+ revenue run-rate. Ipsilon was a leader in the MPLS, Multi-protocol Label Switching, an IP service delivery standard.

19. From 2000 to 2003, I was President and CEO of VC-funded wireless startup CoWave Networks, and from 2003 to 2005, I was President and CEO of Arcwave, Inc., which formed when CoWave Networks merged with Advanced Radio Cells. In this role, I led the definition and technology development of broadband residential wireless mesh technology products (MeshCast™), including managing IEEE 802.16a standardization efforts and ASIC development. I also led the definition and technology development of a last-mile wireless cable extension product for an enterprise broadband voice/data service offering from the cable

industry. Customers included Comcast, Time Warner, Cox, Adelphia, Charter, Mediacomm, and CableOne.

20. From 2005 to 2006, I was an Entrepreneur-in-Residence at venture capital firm Venrock Associates, assisting in identifying attractive new business opportunities in the wireless, security, networking, and location services/navigation markets.

21. In 2007, I served as the President and CEO of Vidient Systems, Inc., a three-year-old venture-backed startup in the video surveillance (video analytics/content analysis) market, whose products include the SmartCatch family of software analytics and hardware processing platforms.

22. From 2007 to 2008, I founded and served as the President and CEO of DataRunway, Inc. At DataRunway, I led a team of six engineers in inventing, designing, and manufacturing a next-generation smart-antenna based 10 Mbps ground-to-air system for providing broadband Internet and phone service to commercial aircraft and private planes in flight.

23. As discussed above, from 2008 to 2009 I was again employed at Trimble Navigation.

24. Since 2006, I have also been an independent consultant specializing in WiFi, WiMax, consumer electronics, and Internet security. In addition to providing expert witness and expert consulting services in connection with patent

litigation, I have provided management consulting services to a number of high tech companies, including working part-time as the Acting VP Marketing for Apacewave, Inc., in Fremont, CA., a WiMax fabless semiconductor company and a Venrock portfolio company.

25. Since 2009, I have been a Partner of the global venture capital firm Venrock. At Venrock, I identify attractive new business opportunities in the wireless, security, networking, location, and embedded systems markets. During my tenure at Venrock, I have served as a Director of 12+ early-stage companies.

26. I am a named inventor on the following two patents and authored or co-authored the academic papers listed below:

- US Patent 5,742,509: Personal tracking system integrated with base station;
- US Patent 4,410,949: Controller for fuel dispenser;
- "Bit Error Rate Performance of a A DS/DPSK Spread Spectrum receiver", S.H. Goldberg and R.A. Iltis, Proceedings of MILCOM, 1985;
- "Joint Interference Rejection / Channel Equalization in DS Spread Spectrum Using the CMA Equalizer and Maximum Likelihood Techniques", R.A. Iltis and S.H. Goldberg, Proceedings of MILCOM, 1987;

- "PN Code Synchronization Effects on Narrowband Interference Rejection in a Direct-Sequence Spread Spectrum Receiver," R.A. Iltis and S.H. Goldberg, IEEE Transactions on Communications, 1988;

- "A single processor packet radio modem for land mobile vehicle tracking applications," G. Kremer, J. MacKnight, R. Lao, and S. Goldberg, Signals, Systems and Computers, 1994, 1994 Conference Record of the Twenty-Eighth Asilomar Conference;

- "Separation and bearing estimation of co-channel signals," B.J. Sublett, R.P. Gooch, S.H. Goldberg, Proceedings of MILCOM 1989;

- "A DS spread spectrum RAKE receiver with narrowband interference rejection capability: operation in fading channels," R.A. Iltis, and S.H. Goldberg, S.H. Proceedings of MILCOM 1989.

27. I have been a member of the Institute of Electrical and Electronic Engineers ("IEEE") since 1983 and a Senior Member of IEEE since 1993. In 1994, I was the President of the IEEE Santa Clara Valley Communications Society. I have also taught courses related to communications technology as an Adjunct Professor at Santa Clara University in 1990 and as Visiting Faculty at the University of California at Santa Barbara in 1985.

III. BASIS FOR OPINIONS AND MATERIALS REVIEWED

28. The opinions set forth in my declaration are based on my personal knowledge gained from my education, personal experience, and on the review of the documents and information described in this declaration.

29. In preparation of this declaration, I have studied:

- U.S. Patent No. 6,535,815 (Ex. 1);
- The File History of U.S. Patent No. 6,55,815 ("the '815 File History") (Ex. 2);
- 3GPP TS RAN R2.03 V0.1.0: "3rd Generation Partnership Project (3GPP); Technical Specification Group (TSG) RAN: Working Group 2 (WG2): Report on Location Services (LCS)," RP-99268, (April 21-23, 1999) (hereinafter "*3GPP LCS Report*") (Ex. 3);
- Newton's Telecomm Dictionary, 15th Ed., August 1999 (Ex. 4);
- Standard dictionaries define the term "source" as a "point of origin or procurement." *See, e.g.*, Ex. 5 at p. 4.
- "An Overview of the Challenges and Progress in Meeting the E-911 Requirement for Location Service," IEEE Communications Magazine, April 1998 ("E-911 Overview Article") (Ex. 6);

- GSM 03.71 Version 7.0, Release 1998: "Digital Cellular Telecommunications System (Phase 2+); Location Services (LCS); Functional Description-Stage 2," July 28, 1999 (hereinafter "*GSM 03.71, Release 1998*") (Ex. 7);

- U.S. Patent No. 6,611,688 (Ex. 8).

IV. LEGAL STANDARDS APPLIED

30. In preparing and expressing my opinions and considering the subject matter of the '815 patent, I am relying on certain basic legal principles that counsel have explained to me. These principles are discussed below.

31. I have been informed that a person of ordinary skill in the art is one who is presumed to have had full knowledge of the relevant prior art at the time of invention and is presumed to think along the lines of conventional wisdom in the art. I understand that the person of ordinary skill may be able to fit together the teachings of multiple prior art references employing ordinary creativity and the common sense that familiar items may have obvious uses beyond their primary purposes. In many cases, a person of ordinary skill will be able to fit the teachings of multiple prior art references together like the pieces of a puzzle.

32. I understand that the hypothetical person of ordinary skill is a person of ordinary skill at the time of the alleged invention. I have been informed that

several factors may help determine the level of skill in the art, such as types of problems encountered in the art, prior art solutions to those problems, the sophistication of the technology involved, and the education level of active workers in the field. I understand the hypothetical person of ordinary skill in the art to which the claimed subject matter pertains would, of necessity, have the capability of understanding the scientific and engineering principles applicable to the pertinent art.

33. I understand that the first step in determining the validity of an asserted claim is for the claim to be properly construed.

34. For purposes of this opinion, I understand that each challenged claim must be viewed from the perspective of a person of ordinary skill in the art at the time of invention in the context of the entire disclosure. I also understand that any special definition for a claim term must be set forth in the specification with "reasonable clarity, deliberateness, and precision."

35. I provide my opinions based on the guidelines set forth above.

V. EFFECTIVE FILING DATE OF THE '815 PATENT

36. I understand the effective filing date of the challenged claims is December 22, 2000.

VI. THE PERSON OF ORDINARY SKILL IN THE ART

37. I have reviewed the ’815 patent, the prior art references cited in the ’815 patent, as well as the prior art documents referenced above. Based on this review and my knowledge of positioning technologies for mobile terminals equipped with a positioning receiver, including my work on multiple GPS based navigational and tracking technologies, which included a product line for tracking people and cargo using cellular phones equipped with GPS receivers, it is my opinion that a person of ordinary skill in the art of the ’815 patent as of December 22, 2000, would have had either: (1) a graduate degree in computer engineering, electrical engineering, applied physics or a related field, and at least three years’ experience in the design and development of GPS based location based services, systems, and/or devices or (2) a bachelor degree in computer engineering, electrical engineering, applied physics or a related field, and at least five years’ experience in the design and development of GPS based location based services, systems, and/or devices.

38. In my opinion, such a person would be capable of reading and understanding the scientific and engineering principles applicable to the field of ’815 patent disclosure.

VII. CLAIM CONSTRUCTION

A. <u>"Quality Of Service" (Claims 1, 8, 9, 10, 17)</u>

39. It is my opinion that one of ordinary skill in the art at the time of the claimed invention, would have understood "quality of service" in light of the specification and grammar of the claims as "an indication of grade or level of performance associated with a computed position estimate." This construction is also consistent with the prior art's use of this term, as well as the patentee's statements during prosecution.

40. The term "quality of service" and its abbreviated form "QoS" appear numerous times in the specification and claims of the '815 patent. Indeed, the term goes to the heart of the alleged improvement being patented. When summarizing the alleged "present invention," the '815 patent states:

> The present invention relates to a mobile terminal equipped with a GPS receiver. The mobile terminal uses one or more ***quality of service (QoS) parameters*** to determine a desired ***QoS*** when the current position of the mobile terminal is requested by an application."
>
> Ex. 1 at 2:20-24 (emphasis added).

41. The patent never explicitly defines quality of service. Nor does the patent provide any definition of a QoS parameter, although the '815 patent states that "[t]he ***QoS parameter specifies a desired quality of service*** for computing

position estimates." Ex. 1 at 2:61-62 (emphasis added); *see also* 2:21-24. The '815 patent does, however, provide a range of examples of quality of service that are consistent with the construction I have set forth above. For example, in connection with one described embodiment, the '815 patent discusses how a user can use a menu to select a quality of service, such as "'Most accurate,' 'Fastest,' or 'Least Expensive'." *Id.* at 5:33-36.

42. The '815 patent also states:

> . . . The QoS instructions to the GPS receiver 101 may include simply a QoS class, or microprocessor 116 may translate the QoS selection into accuracy and time-to-first-fix (TTFF) requirements.
>
> Given the QoS requirements, GPS receiver 101, or alternatively the microprocessor 116, estimates if the currently stored aiding data (e.g., ephemeris, almanac, approximate receiver location, local estimate of GPS time, and availability of differential GPS (DGPS) corrections, etc.) is sufficient to meet the desired QoS requirements (block 156). If the GPS receiver 101 is already operational and producing position/time solutions, then the only evaluated criterion is ***accuracy***. Otherwise, if ***time-to-first-fix or sensitivity*** is part of the QoS requirement, then this process may include one or more of the following tests[.]

Ex. 1 at 6:9-24 (emphasis added).

43. The attributes of accuracy, TTFF, sensitivity, speed, and cost, that are discussed in the ’815 patent are all indications of a *grade or level of performance* that is to be associated with the computed position estimate. Accordingly, the specification of the ’815 patent is consistent with the construction of the term “quality of service” set forth above. This is also consistent with patentee’s statements during prosecution of the ’815 patent. *See* Ex. 2 at p. 50 (“QoS parameters have been used in various networks for various reasons, for example, to define priority levels, latency requirements, error and data rates, recovery strategies, and message sequencing.”). Thus, for example, a speed related quality of service (such as “Fastest”) may be some quality of service performance level suggesting higher or lower priority than another, or latency requirements that favor more or less delay, or a larger or smaller time interval between a request for a position estimate and a TTFF or computation of that position estimate. Additionally, an accuracy related quality of service (such as “Most accurate”) may be some quality of service performance level suggesting a level of acceptable error between the computed position estimate and the true position of the mobile terminal. Further still, a cost related quality of service (such as “Least Expensive”) may be some quality of service performance level indicative of the costs involved in computing the desired position estimate, and thus, for example, may take into

account the "per minute, per use, or per bit charges" for retrieving aiding data. Ex. 1, 2:10-16, 2:33-40.

44. The above construction is also supported by the prior art. This is illustrated, for example, by the *E-911 Overview Article* (Ex. 6). This article discusses the numerous challenges that were presented to the cellular industry when the FCC adopted rules for enhanced 911 (E-911) services. *See, e.g.*, Ex. 1005 at pp. 1-2, 7. Among the challenges for GSM based networks and equipment operators included the adoption of standards that would "ensure compatibility among different equipment vendors and seamless operation between various service providers." *Id.* at 5. The GSM location services (LCS) standards considered for adoption prior to April 1998 would permit "a user to be positioned with a certain ***quality of service*** (***accuracy, periodicity, and response time***) depending on the needs of the application." *See id.* at 5 (emphasis added). Similarly *GSM 03.71, Release 1998* mentions "quality of service" or "QoS" twenty-five times. Ex. 7 at pp. 13, 14, 16, 23-27, 30, 50, 54. This GSM Technical Specification describes quality of service as including, for example, accuracy, response time, and preferred/required positioning method. *Id.* at 25. Finally, the *3GPP LCS Report* provides:

> Different applications demand different levels of positioning accuracy and other positioning performance parameters, so the levels of performance should be

> classified according to the type of applications. When an application requests the current location information of the mobile terminal, it can also indicate or require a certain (minimum) level of quality of the location indication. The quality of location information can involve parameters like accuracy, update frequency, time stamp, time-to-first-fix, reliability, continuity, etc. in a feasible way.
>
> Ex. 3 at p. 15 (emphasis added).

45. The foregoing demonstrates that TCL's proposed construction of "quality of service" as being "*an indication of grade or level of performance associated with a computed position estimate*" is the correct construction.

B. <u>"Compute/Computing Said Current Position Of Said Mobile Terminal" (Claims 11, 12, 15, and 16)</u>

46. In light of the specification and the claim language of the '815 patent, it is my opinion that one of ordinary skill in the art at the time of the claimed invention, would have understood the claim term "compute/computing said current position of said mobile terminal" as "*determine/determining the current position of the mobile terminal using GPS calculations*."

47. Computing the position of a mobile terminal using GPS receiver will always results in an estimate of the actual position of the mobile terminal. This has always been the case since the first GPS satellites were launched in 1978. Thus, it

is not surprising that the '815 patent uses the terms "compute an estimate of said current position" and "computing said current position of said mobile terminal" interchangeably. *See, e.g.*, Ex. 1 at 2:54-58, 2:62-65, 6:66-7:20, 7:30-43, 8:21-24. For example, the '815 patent describes that a GPS receiver "can optimize time for estimating its current position … based on one or more quality of service (QoS) parameters." *Id.* at 2:54-58. In another instance, the '815 patent states that "[w]hen a position estimate is requested by an application, the mobile terminal 100 determines whether the aiding data currently stored in memory is sufficient to meet the QoS requirements." *Id.* at 2:62-65. Turning to the claims, claim 1 of the '815 patent recites "receiving a request for said current position of said mobile terminal," and "determining whether aiding data stored in said mobile terminal is sufficient to compute an estimate of said current position…." *Id.* at 7:30-43. Claim 14 also plainly demonstrates that "computing said current position" is only an estimate. Claim 14 provides: "wherein computing said current position of said mobile terminal comprises computing said current position based ***on aged ephemeris data***." *Id.* at 8:21-24 (emphasis added). The specification of the '815 patent would have made it clear to one of ordinary skill in the art that using "aged ephemeris data" will result in a GPS calculation of the "current position" that does not necessarily meet the final desired QoS accuracy:

> Satellite ephemeris may be applicable for a period of four hours. Satellite ephemeris older than four hours would, therefore, constitute aged data. In this manner, the GPS receiver 101 utilizes existing information to the fullest extent possible while waiting for the up-to-the-date information from the server. ***This may include using almanac or aged ephemeris data to acquire and measure satellite signals and compute an approximate position, which does not necessarily meet the final accuracy QoS***.

Id. at 6:66-7:9 (emphasis added).

48. The foregoing demonstrates that "computing an estimate of said current position" and "computing said current position" each involves the determination of the current location of the mobile terminal using GPS calculations, which inherently involves estimating a position.

49. TCL's construction is also confirmed by the patentee's characterization of the alleged invention during prosecution. During prosecution, the patentee stated:

> Applicant's invention relates to ***a mobile terminal equipped with a GPS receiver*** that may use one or more quality of service (QoS) parameters ***for estimating its location***. … Upon receiving the position location request, ***the mobile terminal will determine if the data***

> ***stored in the mobile terminal*** (e.g., almanac data, ephemeris data, etc.) ***is sufficient to estimate its position within the bounds required by the QoS parameters***. Provided the stored data is sufficient, ***the mobile terminal may forego attempts to acquire and read ephemeris or almanac data***, which can take several minutes, ***and compute its position from the transmitted GPS signals***. If, however, the stored data is insufficient to meet the QoS requirement, the mobile terminal may acquire additional information from the network or by reading the needed information from the GPS signals. This allows the mobile terminal to optimize the time required for estimating its current position, and thus, minimizes network traffic.

Ex. 2 at pp. 48-49 (emphasis added). Patentee's own prior art, U.S. Patent No. 6,611,688, also supports this construction. Ex. 8.

50. In summary, it is my opinion that "*determine/determining the current position of the mobile terminal using GPS calculations*" is supported by the specification and claims of the patent, Patentee's statements during prosecution, and the prior art, and is the correct construction for the "compute" and "computing" terms set forth above.

51.

C. "Requesting Application" (Claim 8)

52. In light of the specification and the claim language, it is my opinion that one of ordinary skill in the art at the time of the claimed invention, would have understood the claim term "requesting application" is "*a software program running on the mobile terminal or external to the mobile terminal that causes an estimate of current position to be calculated.*" A telecommunications dictionary—Newton's Telecomm Dictionary, 15th Ed., August 1999—defines an "application" as "a software program that carries out some useful task." Ex. 4 at p. 4. Moreover, the '815 patent explains that "positioning application 26" can be "running either within the mobile terminal 100 itself or in the mobile communication network 10." Ex. 1 at 5:26-28.

53. I reserve the right to supplement my opinions to address any information obtained, or new positions taken, based on any new information that comes to light throughout this proceeding.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct. Executed this 28 day of August, 2015 at Cupertino, California.

Dr. Steven H. Goldberg, Ph.D.